

## **APPENDIX A**

Summary of BLM Consultation Efforts and Information Exchange  
Related to the Leeville Project

Summary of BLM'S Consultation Efforts and Information Exchange Related to the Leeville Project			
Contact Date	Contacted	Via	Response
5-22-97	Te-Moak Tribal Chair	Certified Letter	No response
	Elko Band Chair	Certified Letter	No response
	Battle Mountain Band Chair	Certified Letter	No response
	Wells Band Chair	Certified Letter	No response
	South Fork Band Chair	Certified Letter	Response 5-30-97
	WSHPS <sup>1</sup>	Certified Letter	No response
6-19-97	Te-Moak Tribal Chair	Phone Call	No response
	Elko Band Chair	Phone Call	No response
	Battle Mountain Band Chair	Phone Call	No response
	Wells Band Chair	Phone Call	No response
	WSHPS	Phone Call	Response 6-27-97
8-25-97	Te-Moak Tribal Chair	Certified Letter	No response
	Elko Band Chair	Certified Letter	No response
	Battle Mountain Band Chair	Certified Letter	No response
	Wells Band Chair	Certified Letter	No response
9-28-98	Te-Moak ED <sup>2</sup>	Monthly Meetings <sup>3</sup>	0 Rep. <sup>4</sup> Present
	Duck Valley ED	Monthly Meetings	2 Rep. Present
	Elko Band ED	Monthly Meetings	0 Rep. Present
	Battle Mountain Band ED	Monthly Meetings	1 Rep. Present
	Wells Band ED	Monthly Meetings	1 Rep. Present
	South Fork Band ED	Monthly Meetings	0 Rep. Present
	WSHPS	Monthly Meetings	1 Rep. Present
	WSDP <sup>5</sup>	Monthly Meetings	3 Rep. Present
10-1-98	Te-Moak Tribal Chair	Certified Letter	No response
	Duck Valley Tribal Chair	Certified Letter	No response
	Shoshone-Bannock ED	Certified Letter	No response
	Elko Band Chair	Certified Letter	Response 10-16-98
	Battle Mountain Band Chair	Certified Letter	No response
	Wells Band Chair	Certified Letter	No response
	South Fork Band Chair	Certified Letter	No response
	WSHPS	Certified Letter	Response 10-16-98
	WSDP	Certified Letter	No response
10-26-98	Te-Moak Tribal Chair	Monthly Meetings	0 Rep. Present
	Duck Valley ED	Monthly Meetings	1 Rep. Present
	Shoshone-Bannock Chair	Monthly Meetings	0 Rep. Present
	Yomba Tribal Chair	Monthly Meetings	0 Rep. Present
	Elko Band Chair	Monthly Meetings	0 Rep. Present
	Battle Mountain Band Chair	Monthly Meetings	1 Rep. Present
	Wells Band Chair	Monthly Meetings	0 Rep. Present
	South Fork Band Chair	Monthly Meetings	0 Rep. Present
	WSHPS	Monthly Meetings	1 Rep. Present
	WSDP	Monthly Meetings	2 Rep. Present
12-16-98	Te-Moak Tribal Chair	Certified Letter	No response
	Duck Valley Tribal Chair	Certified Letter	No response
	Shoshone-Bannock ED	Certified Letter	No response
	Elko Band Chair	Certified Letter	No response
	Battle Mountain Band Chair	Certified Letter	No response
	Wells Band Chair	Certified Letter	No response
	South Fork Band Chair	Certified Letter	No response
	WSDP	Certified Letter	Response 12-1-98
1-5-99	Te-Moak Tribal Chair	Meeting at BLM	0 Rep. Present
	Duck Valley Tribal Chair	Meeting at BLM	1 Rep. Present
	Shoshone-Bannock ED	Meeting at BLM	0 Rep. Present
	Elko Band Chair	Meeting at BLM	0 Rep. Present
	Battle Mountain Band Chair	Meeting at BLM	1 Rep. Present
	Wells Band Chair	Meeting at BLM	2 Rep. Present
	South Fork Band Chair	Meeting at BLM	2 Rep. Present
	WSHPS	Meeting at BLM	1 Rep. Present
	WSDP	Meeting at BLM	4 Rep. Present

Summary of BLM'S Consultation Efforts and Information Exchange Related to the Leeville Project			
Contact Date	Contacted	Via	Response
2-2-99	Te-Moak Tribal Chair	Meeting at GBC <sup>6</sup>	0 Rep. Present
	Duck Valley ED	Meeting at GBC	2 Rep. Present
	Shoshone-Bannock ED	Meeting at GBC	0 Rep. Present
	Elko Band Chair	Meeting at GBC	1 Rep. Present
	Battle Mountain Band ED	Meeting at GBC	1 Rep. Present
	Wells Band Chair	Meeting at GBC	0 Rep. Present
	South Fork Band Chair	Meeting at GBC	0 Rep. Present
	WSHPS	Meeting at GBC	1 Rep. Present
	WSDP	Meeting at GBC	3 Rep. Present
2-9-99	Te-Moak Tribal Chair	Certified Letter	No response
	Duck Valley Tribal Chair	Certified Letter	No response
	Shoshone-Bannock ED	Certified Letter	No response
	Elko Band Chair	Certified Letter	No response
	Battle Mountain Band Chair	Certified Letter	No response
	Wells Band Chair	Certified Letter	No response
	South Fork Band Chair	Certified Letter	No response
	WSHPS	Certified Letter	No response
	WSDP	Certified Letter	No response
3-15-99	Te-Moak Tribal Chair	Meeting at BLM	Response 3-15-99
	Duck Valley Tribal Chair	Meeting at BLM	1 Rep. Present
	Shoshone-Bannock ED	Meeting at BLM	0 Rep. Present
	Elko Band Chair	Meeting at BLM	2 Rep. Present & Response 3-23-99
	Battle Mountain Band Chair	Meeting at BLM	0 Rep. Present
	Wells Band Chair	Meeting at BLM	0 Rep. Present
	South Fork Band Chair	Meeting at BLM	2 Rep. Present
	WSHPS	Meeting at BLM	0 Rep. Present
	WSDP	Meeting at BLM	3 Rep. Present & Response 5-21-99
	Yomba Tribe	Meeting at BLM	1 Rep. Present
7-22-99	South Fork Band ED	In the Field	2 Rep. Present
	Wells Band ED	In the Field	1 Rep. Present
	Elko Band ED	In the Field	1 Rep. Present
	Battle Mountain Band ED	In the Field	4 Rep. Present
9-2-99	Te-Moak Tribal Chair	Fax	No response
	Duck Valley Tribal Chair	Fax	No response
	Elko Band ED	Fax	No response
	Battle Mountain Band ED	Fax	No response
	Wells Band Chair	Fax	No response
	South Fork Band Chair & ED	Fax	No response
	WSHPS	Fax	No response
	WSDP	Fax	No response
3-15-00	Te-Moak Tribal Chair	Monthly Meetings	1 Rep. Present
	Duck Valley ED	Monthly Meetings	0 Rep. Present
	Shoshone-Bannock Chair	Monthly Meetings	0 Rep. Present
	Elko Band Chair	Monthly Meetings	0 Rep. Present
	Battle Mountain Band Chair	Monthly Meetings	2 Rep. Present
	Wells Band Chair	Monthly Meetings	1 Rep. Present
	South Fork Band Chair	Monthly Meetings	2 Rep. Present
	Ely Shoshone Tribe	Monthly Meetings	2 Rep. Present
	WSDP	Monthly Meetings	2 Rep. Present
9-26-00	Te-Moak Tribal Chair	Certified Letter	Response 10-30-00
	Duck Valley Tribal Chair	Certified Letter	No response
	Elko Band Chair	Certified Letter	No response
	Battle Mountain Band Chair	Certified Letter	Response 11-14-00
	Wells Band Chair	Certified Letter	Response 10-19-00
	South Fork Band Chair	Certified Letter	No response
	WSDP	Letter	Response 10-31-00
	Ely Shoshone Tribe	Letter	Response 10-31-00
	Lois Whitney, WSA <sup>7</sup>		Response 10-31-00

Summary of BLM'S Consultation Efforts and Information Exchange Related to the Leeville Project			
Contact Date	Contacted	Via	Response
9-27-00	Te-Moak Tribal Chair	Monthly Meetings	1 Rep. Present
	Elko Band Chair	Monthly Meetings	1 Rep. Present
	Battle Mountain Band Chair	Monthly Meetings	1 Rep. Present
	Wells Band Chair	Monthly Meetings	1 Rep. Present
	South Fork Band Chair	Monthly Meetings	2 Rep. Present
	WSDP	Monthly Meetings	1 Rep. Present
	Duckwater Tribe	Monthly Meetings	2 Rep. Present
11-28-00 / 12-7-00	Te-Moak Tribal Chair & ED	CL <sup>8</sup> /Meeting at BLM	0 Rep. Present
	Duck Valley Tribal Chair	CL/Meeting at BLM	0 Rep. Present
	Elko Band Chair	CL/Meeting at BLM	0 Rep. Present
	Battle Mountain Chair & ED	CL/Meeting at BLM	1 Rep. Present
	Wells Band Chair & ED	CL/Meeting at BLM	2 Rep. Present
	South Fork Band Chair	CL/Meeting at BLM	1 Rep. Present
	WSDP	Letter/Meeting at BLM	2 Rep. Present
	Ely Shoshone Chair & ED	CL/Meeting at BLM	0 Rep. Present
1-10-01 / 1-18-01	Lois Whitney, WSA	Letter/Meeting at BLM	Present
	Te-Moak Tribal Chair & ED	CL/Meeting at HH <sup>9</sup>	1 Rep. Present
	Duck Valley Tribal Chair	CL/Meeting at HH	0 Rep. Present
	Elko Band Chair	CL/Meeting at HH	0 Rep. Present
	Battle Mountain Chair & ED	CL/Meeting at HH	1 Rep. Present
	Wells Band Chair & ED	CL/Meeting at HH	2 Rep. Present
	South Fork Band Chair & ED	CL/Meeting at HH	2 Rep. Present
	WSDP	CL/Meeting at HH	2 Rep. Present
2-10-01	WSHPS	CL	Response 1-17-01
	Lois Whitney, WSA	FAX/Meeting at HH	Present
	Te-Moak Tribal Chair & ED	Fax Meeting at BLM	1 Rep. Present
	Duck Valley Tribal Chair	Fax/Meeting at BLM	0 Rep. Present
	Elko Band Chair	Fax/Meeting at BLM	1 Rep. Present
	Battle Mountain Chair & ED	Fax/Meeting at BLM	1 Rep. Present
	Wells Band Chair & ED	Fax/Meeting at BLM	3 Rep. Present
	South Fork Band Chair & ED	Fax/Meeting at BLM	2 Rep. Present
	Ely Shoshone Chair	Fax/Meeting at BLM	2 Rep. Present
	WSDP	Fax/Meeting at BLM	1 Rep. Present
	WSHPS	Fax/Meeting at BLM	0 Rep. Present
	Lois Whitney, WSA	Fax/Meeting at BLM	Present

- <sup>1</sup> Western Shoshone Historic Preservation Society
- <sup>2</sup> Environmental Division
- <sup>3</sup> Information exchange meetings held on a regular basis between the BLM and the Western Shoshone
- <sup>4</sup> Denotes number of representatives present at the meeting
- <sup>5</sup> Western Shoshone Defense Project
- <sup>6</sup> Great Basin College
- <sup>7</sup> Western Shoshone Advocate
- <sup>8</sup> Certified Letter
- <sup>9</sup> Hilton Hotel

## **APPENDIX B**

Summary of the Numerical Ground-Water Flow Modeling for the  
Leeville Project

## **APPENDIX B**

### **SUMMARY OF NUMERICAL GROUNDWATER FLOW MODELING FOR THE LEEVILLE PROJECT**

#### **INTRODUCTION**

A numerical groundwater flow model, referred to as the Carlin Trend Model, was used by Newmont to predict dewatering rates and possible effects on water resources resulting from mine dewatering in the Carlin Trend north of the Humboldt River. This model uses MINEDW, a proprietary code developed by Hydrologic Consultants, Inc. (HCI). This is a three-dimensional, finite-element groundwater flow code that has been tested and verified by Sandia National Laboratory (1998). Sandia concluded that the conceptual model solved by the code is appropriate for the intended use in the Carlin Trend Model, the numerical techniques used are appropriate, and MINEDW correctly solves the mathematical equations.

Information about the model setup and implementation is provided in HCI (1999a). A comprehensive summary of the model and its application in the Carlin Trend is included in Appendix D of the Bureau of Land Management's (BLM 2000) "Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project". Specific information about modeling as it pertains to the Leeville Project is presented in the report, "Numerical Ground-Water Flow Modeling of Leeville Project" (HCI 1999b).

Hydrogeologic conditions in the vicinity of mines in the Carlin Trend are complex due to various hydrostratigraphic units that have been subject to widespread faulting. Regional groundwater flow models are based on a simplified conceptual understanding of hydrogeologic conditions, including structural control, hydraulic characteristics, recharge and discharge, and groundwater flow patterns. Unknown or undetected conditions may exist that could have an influence on dewatering effects that are not predicted by the model. For long-term predictions, there is uncertainty about future climatic conditions. Despite these limitations, numerical models that are based on an accurate conceptual model of the area's hydrogeologic conditions, and properly calibrated, represent the best available tool for predicting effects of mine dewatering.

#### **MODEL DOMAIN**

The regional Carlin Trend model encompasses groundwater systems potentially affected by dewatering from major mines north of the Humboldt River: Betze/Post, Gold Quarry, and Leeville mines. This area includes the hydrologic basins of Maggie Creek, Boulder Flat, Susie Creek, Marys Creek, Rock Creek Valley, Willow Creek Valley, and Independence Valley. The proposed Leeville Mine lies within the groundwater cone of depression created by existing mines -- primarily Betze/Post and Gold Quarry. Since

water levels in the Leeville area are already lowered, dewatering at Leeville would add to drawdown created by existing and future mine dewatering.

In order to evaluate potential effects of dewatering from the Leeville Mine, two scenarios were modeled: (1) dewatering from the Betze/Post, Gold Quarry, and Leeville mines; and (2) dewatering from only the Betze/Post and Gold Quarry mines (no Leeville dewatering). Results of these two model simulations were compared to determine the specific effects that dewatering at Leeville would have on water resources in the project area. Dewatering rates for Betze/Post and Gold Quarry also included minor pumping from the Genesis, Deepstar, and Sheep Creek Canyon sites.

## **MODEL UPDATES**

The Carlin Trend model was first developed by HCI in the mid-1990s for the Gold Quarry Mine. Additional updates to the model were completed in 1999 by HCI (1999b) based on new hydrogeologic information for the Carlin Trend. Some of the updates relevant to the Leeville Mine include:

- Simulation of some tributaries to the main creeks where flow infiltrates and recharges the groundwater system.
- Addition or movement of faults as barriers to groundwater flow in various locations, including a fault along the eastern boundary of Rock Creek Valley in the Sheep Creek Mountains, several faults around Marys Mountain, the Roberts Mountain thrust under Marys Mountain, and basin bounding fault along western flank of Tuscarora Mountains north of Four Corners.
- Addition of a barrier to groundwater flow north of the Leeville area in carbonate rocks.
- Hydraulic properties of some units were changed to improve steady-state and transient calibrations.
- Addition of predicted dewatering at Leeville which generally consisted of the following pumping rates: 25,000 gallons per minute (gpm) during the first 2 years of operation, 10,000 to 20,000 gpm during years 3 through 5, and 8,000 to 10,000 gpm for the remaining life of the mine.

## **MODEL RESULTS**

The Carlin Trend model predicted areas of lateral and vertical groundwater drawdown resulting from Leeville dewatering. This drawdown would be in addition to drawdown that is occurring and will continue from dewatering primarily at the Betze/Post and Gold Quarry mines. Figure 4-2 in this EIS shows the lateral extent of water table drawdown based on the maximum extent of the 10-foot drawdown contour that is predicted to occur using the Carlin Trend Model. Figure 4-2 shows the 10-foot isopleth for the two model simulations described above under *Model Domain*. Comparison of the two contour lines shows that Leeville would result in a lateral extension of the cone of depression in three relatively small areas: (1) central Boulder Flat area; (2) along drainage divide between Maggie and Susie Creeks; and (3) central portion of Beaver Creek in the upper Maggie Creek basin.

Closer review of HCI's (2001) model results in the Beaver Creek area show that predicted drawdown of the water table would be less than 5 feet near the creek (Figure

B-1). This area, however, was included within the 10-foot isopleth shown on Figure 4-2 in this EIS because a single model node north of Beaver Creek had a predicted drawdown of 12 feet (Figure B-1). The predicted decrease in Beaver Creek flow that may occur as a result of the water table drawdown would be approximately 0.05 cubic feet per second (cfs) or 22 gpm (Figure B-2). Even though there are no flow measurement records for Beaver Creek, other nearby streams in the area indicate that 0.05 cfs is well within the daily fluctuation of natural flow conditions. The lower reaches of these tributary streams typically are dry except during extreme precipitation or snowmelt events. The upper stream reaches (i.e., above 6000 feet elevation) typically have year-round flow due to perched aquifers in the mountains that are not connected to the groundwater system that would be affected by mine dewatering.

Figure 4-3 in this EIS shows the area of more than 10 feet of additional drawdown in the water table aquifer that would be caused by Leeville dewatering within the regional cone of depression. This area extends several miles primarily along a north-south trend from the Leeville site due to structural control by faults. The magnitude of drawdown shown on Figure 4-3 would be additive to lowering of the water table that has occurred and will continue due to dewatering primarily from the Betze/Post and Gold Quarry mines.

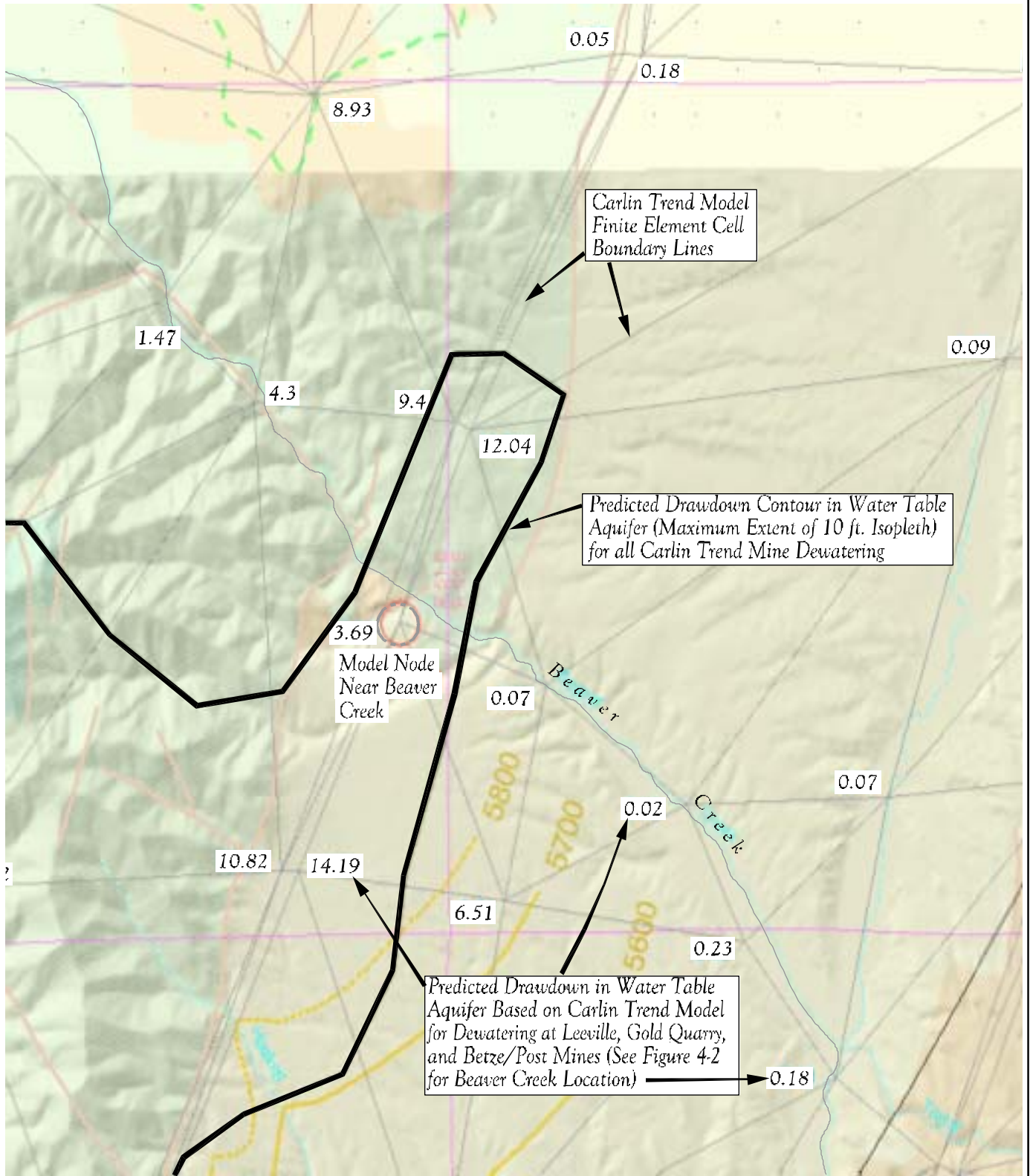
The water table aquifer depicted in Figure 4-3 represents layer one of the groundwater model. Layer one at Leeville is composed primarily of Upper Plate rocks (siltstone) that are not in direct hydraulic communication with underlying Lower Plate rocks (carbonate). Most dewatering at Leeville would occur in Lower Plate rocks. Lower Plate rocks are exposed at the surface west and south of the Leeville site (i.e., Tuscarora Spur and Richmond Mountain) and are included in layer one of the model in those areas. Additional groundwater drawdown greater than 100 feet would occur in those areas. A major hydrogeologic boundary, the Tuscarora Fault, limits the amount of drawdown southwest of Leeville in the Marys Mountain and Gold Quarry areas.

The Carlin Trend Model also was used to predict impacts to stream baseflow in the study area (HCI 1999b). Leeville dewatering is predicted to cause additional reduction in streamflow, on a cumulative basis, of less than 0.1 cfs (45 gpm) for each of Marys, Maggie, and Boulder Creeks. In addition, effects predicted for the Humboldt River would be less than 0.1 cfs flow reduction.

## REFERENCES

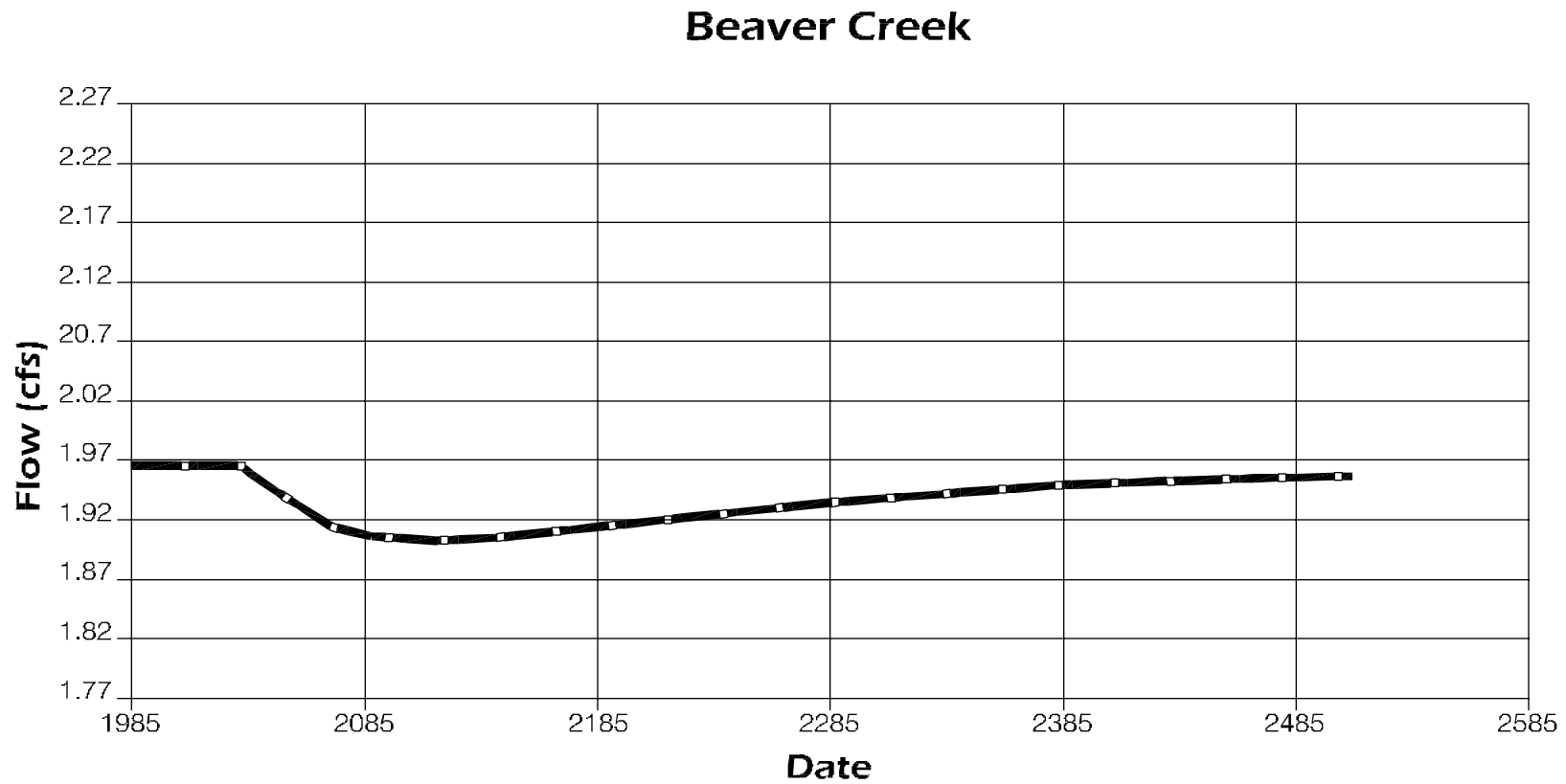
- Hydrologic Consultants, Inc. (HCI), 1999a. Prediction of Potential Hydrologic Impacts of Dewatering Operations Along Northern Carlin Trend. Prepared for Newmont Gold Company.
- \_\_\_\_\_, 1999b. Numerical Ground-Water Flow Modeling of Leeville Project, Eureka County, Nevada. Prepared for Newmont Gold Company.
- \_\_\_\_\_, 2001. Results of Groundwater Drawdown and Reduction in Streamflow at Model Nodes for Beaver Creek and Jack Creek for Cumulative Model Run. Submitted via email by Paul Pettit of Newmont Mining Corporation to Maxim Technologies, Inc. on October 16 & 26, 2001.





0 Miles 1

Carlin Trend Model Results  
in Vicinity of Beaver Creek  
Leeville Project  
FIGURE B-1



Note: Graph shows change in Beaver Creek base flow as predicted by the Carlin Trend Model for the area shown on Figure B-1 resulting from dewatering at Leeville, Gold Quarry, and Betze/Post mines.

Predicted Change in Beaver Creek  
Flow from Mine Dewatering  
Leeville Project  
FIGURE B-2